Quantitative Finance > General Finance

Boolean delay equations on networks: An application to economic damage propagation

B. Coluzzi, M. Ghil, S. Hallegatte, G. Weisbuch

(Submitted on 3 Mar 2010)

We introduce economic models based on Boolean Delay Equations: this formalism makes easier to take into account the complexity of the interactions between firms and is particularly appropriate for studying the propagation of an initial damage due to a catastrophe. Here we concentrate on simple cases, which allow to understand the effects of multiple concurrent production paths as well as the presence of stochasticity in the path time lengths or in the network structure.
In absence of flexibility, the shortening of production of a single firm in an isolated network with multiple connections usually ends up by attaining a finite fraction of the firms or the whole economy, whereas the interactions with the outside allow a partial recovering of the activity, giving rise to periodic solutions with waves of damage which propagate across the structure. The damage propagation speed is strongly dependent upon the topology. The existence of multiple concurrent production paths does not necessarily imply a slowing down of the propagation, which can be as fast as the shortest path.

Comments:	Latex, 52 pages with 22 eps figures
Subjects:	**General Finance (q-fin.GN)**; Cellular Automata and Lattice Gases (nlin.CG)
Cite as:	**arXiv:1003.0793v1 [q-fin.GN]**

Submission history

From: Barbara Coluzzi [view email]
[v1] Wed, 3 Mar 2010 12:57:43 GMT (1106kb)

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